REMARKS

Claims 1-3 remain pending after amendment.

Applicants' Invention

By way of review, applicants' claim 1 is directed to an olefin block copolymer having a ratio Mw/Mn of not more than 1.5, and which copolymer comprises:

(i) a polymer block comprising ethylene and an α-olefin of 3 to 20 carbon atoms, having a molar ratio (ethylene/α-olefin) of ethylene units to α-olefin units of from 20/80 to 65/35, a weight average molecular weight of 50,000 to 2,000,000, and having a slope of an intramolecular composition distribution of absolute value of 0.1 to 0, and

(ii) a polymer block comprising ethylene and an α-olefin of 3 to 20 carbon atoms, having a molar ratio (ethylene/α-olefin) of ethylene units to α-olefin units of from 70/30 to 85/15, a weight average molecular weight of 10,000 to 400,000, and having a slope of an intramolecular composition distribution of absolute value of 0.1 to 0.

Applicants' specification at page 12, lines 18-22 teaches that "to detail the slope (CD) of the intramolecular composition distribution, the larger the value, the broader the intramolecular composition distribution, and the smaller the

value, the narrower the intramolecular composition distribution".

The olefin block copolymer of the present invention accordingly comprises two polymer blocks (i) and (ii). Polymer block (i) contains ethylene in an amount of 20-65 mole %, while polymer block (ii) contains ethylene in a greater amount of 70-85 mole %. *Both polymer blocks have a very narrow intramolecular composition distribution of absolute value of 0.1 to 0.*

Such characteristics enable the claimed block copolymer to function with advantage, for example, as a viscosity index improver in lubricating compositions.

Applicants' claimed invention is neither disclosed nor suggested by the cited prior art.

Rejection under 35 USC 103(a)

Claims 1-3 stand rejected under 35 USC 103(a) as being unpatentable over Ver Strate et al U.S. Patent No. 4,804,794.

In support of the rejection, the Examiner states at pages 3 and 4 of the Official Action:

> "There are no process conditions in the present claims. The applicants argue that the intramolecularly heterogeneous chain of Ver Strate has a broad (not narrow) intramolecular composition distribution. Ver Strate does not disclose an intramolecular composition distribution having absolute value of 0.1 to 0.

> Reference discloses that the controlled segmented nature of the polymers is essential to their performance, col. 9, line 66. The property of the copolymer related to intramolecular compositional dispersity (intra-CD), col. 12, lines 55-58. The intramolecular composition distribution is depending on the process conditions that can be predicted, col. 19, lines 10-16. The block copolymer in Ver Strate has the same properties for using as viscosity index improvers or viscosity modifier for a lubrication oil composition, col. 28, lines 41-42. It would have been obvious to one of ordinary skill in the art to consider that the intramolecular composition distribution of 0.1 to 0 could be obtained in Ver Strate because reference does disclose different ethylene content in each block copolymer, different crystallinity value of each block copolymer, the narrow molecular weight distribution and the same property of using."

The rejection of the Examiner respectfully is traversed.

The Ver Strate reference discloses copolymers of ethylene and at least one other alpha-olefin monomer, *where the copolymer comprises intramolecularly heterogeneous copolymer chains* containing at least one crystallizable segment of methylene units and at least one low crystallinity ethylene-alpha-olefin copolymer segment. The at least one crystallizable segment comprises *at least* about 10 weight percent of the copolymer chain and contains an average ethylene content of *at least about 57 weight percent*, and wherein the low crystallinity segment contains an average ethylene content *not greater than* about 53 weight percent. The copolymer also has a molecular weight distribution characterized by at least one of a ratio of Mw/Mn

of less than 2 and a ratio of Mz/Mw of less than 1.8, and wherein at least two portions of an individual intramolecularly heterogeneous chain (each portion comprising at least 5 weight percent of said chain) differ in composition from one another by at least 7 weight percent ethylene (see claim 1).

Ver Strate also discloses at column 12, lines 12-48 that the copolymer is preferably made in a tubular reactor, and these copolymer chains are therefore tapered in composition and intramolecularly heterogeneous. The polymer is prepared in the presence of Ziegler catalysts, preferably comprising a hydrocarbon-soluble vanadium compound in which the vanadium balance ranges from 3 to 5 and an organo-aluminum compound (see claim 1; column 21, line 35 to column 22, line 46, and the examples).

The intramolecularly heterogeneous chain of Ver Strate has a broad (not narrow) intramolecular composition distribution as explained below, and thus the copolymer of the reference and the claimed copolymer are completely distinct with respect to the value of the CD gradient.

This is because the process conditions of Ver Strate, i.e., the catalyst system employed in addition to the use of a tubular reactor, produce a copolymer having different characteristics than the claimed copolymer.

More specifically, Ver Strate teaches producing the copolymer in the presence of a vanadium catalyst utilizing the difference of the consumption rate (reactivity) between ethylene and propylene together with the use of a tubular reactor.

As disclosed at column 12, lines 12-48 of Ver Strate, the copolymer chains which are higher in ethylene concentration in the chain segments are formed near the reactor inlet, and are higher in propylene concentration in chain segments formed near the reactor outlet, because ethylene is predominately consumed near the reactor inlet and the remaining propylene polymerizes near the reactor outlet due to the difference of reactivity between ethylene and propylene.

Thus, the transition of the ethylene/propylene composition in the copolymer (intra-CD) depends on the change of the ethylene/propylene concentration as the copolymer is produced in the tubular reactor.

The change of ethylene/propylene composition in the copolymer (intra-CD) of Ver Strate is continuous and moderate, and the ethylene/propylene composition in the copolymer (intra-CD) of Ver Strate cannot be easily modified.

The above discussion can be confirmed by reference to the slope (fractional length vs. ethylene content) shown in Figs 7-17 of Ver Strate which are almost all identical.

The copolymer shown in Figures 7-15 and 17 of the reference comprises two or more copolymer segments having nearly identical ethylene content, and each segment has a broad (not narrow) intramolecular composition distribution of ethylene judging from the slope of ethylene content vs. fractional length along contour chain. The CD gradient of the copolymer of Figs. 7-15 can be estimated by dividing the difference between the highest ethylene content and the lowest ethylene content by 100.

Concerning the CD gradient of the copolymer of Ver Strate as shown in Figure 7, it can be roughly calculated as being 0.2 - (72.5 wt% - 52.5 wt%)/(100 wt%) - although it has to be calculated in the range of 90 wt% as described in the specification.

The copolymers shown in Figures 8-13 are the same as those of Figure 7, and it can be said that the copolymers of the present invention and those of Ver Strate are completely different from each other with respect to the value of the CD gradient.

The copolymer of Ver Strate as shown in Figure 16 comprises two copolymer blocks having different ethylene content and is nearly the same as that disclosed in Example 3A in JP-B-6(1994)/96624 (corresponding to U.S. Patent No. 4,959,436), which is cited as Polymerization Example 4 in the specification.

The CD gradient determined with respect to the copolymer in Polymerization Example 4 is 0.17, which is clearly outside of the range recited in applicants' claim 1 of 0.1 to 0.

The copolymers of Ver Strate as shown in Figures 14, 15 or 17 comprise two or more copolymer blocks having a slightly different ethylene content which is nearly the same as that disclosed in Example 3B in JP-B-6(1994)/96624 (corresponding to U.S. Patent No. 4,959,436), which is cited as polymerization Example 3 in the specification.

The CD gradient determined with respect to the copolymer in Polymerization Example 3 was 0.11, and it is clearly outside of the numeral range recited in the present claim 1.

Moreover, comparing Example 1 with the use of a copolymer defined in claim 1 as a viscosity index improver and Comparative Examples 2 and 3 with the use of a copolymer prepared in Polymerization Example 3 and 4, respectively, it is apparent that, based on the lubricating properties of Ssi, CCS viscosity at -20°C and MR viscosity at -30°C, the results of Example 1 are clearly superior to those of comparative Examples 2 and 3.

The cited reference thus fails to disclose both the claimed invention as well as the advantages provided thereby.

Further, the basic premise of the Examiner offered in support of the rejection is flawed. The Examiner states at page

4 of the rejection that "It would have been obvious to one of ordinary skill in the art to consider that the intramolecular composition distribution of 0.1 to 0 ***could be obtained*** in Ver Strate because reference does disclose different ethylene content in each block copolymer, different crystallinity value of each block copolymer, the narrow molecular weight distribution and the same property of using."

Such an analysis of the reference is based solely on a hindsight analysis of the reference - which is improper. Ver Strate fails to teach or suggest the claimed copolymer having the recited physical properties. The Examiner acknowledges that the reference fails to disclose an intramolecular composition distribution having an absolute value of 0.1 to 0 as claimed. While the Examiner notes that applicants' claims do not include process limitations, it is further clear that Ver Strate does not teach those process conditions that would result in the claimed copolymer. Given the above, the only way to arrive at applicants' invention based on the teachings of Ver Strate is to not only ignore those teachings but to also assume that one of ordinary skill in the art, when faced with such teachings, ***could*** arrive at the claimed invention (pure speculation at best). Of course, the Examiner points to no motivation in Ver Strate that would lead such a person in that direction.

As a result, the rejection of claims 1-3 is without basis and should be withdrawn.

The application is accordingly believed to be in condition for allowance, and an early indication of same earnestly is solicited.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Raymond C. Stewart, #21,066
P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

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